OBJECTIVES

-Create a robot to:

-Use an infrared sensor to detect infrared light

-Use a proximity sensor to measure distance from drop off (12 inches)

-Mechanism to drop of marker once robot is stopped

-Control robot using joystick and LabView Software

EXISTING SEARCH AND RESCUE ROBOTS

-Serpentine

-By CMU Robotics Institute

-Snake like motion, easy to get through narrow spaces

-Amoeba like SRR

-Movement by contracting and expanding actuator rings

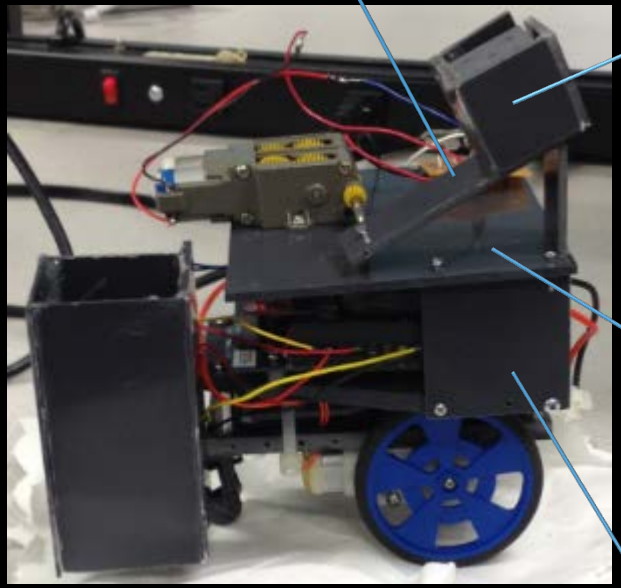
-Toroidal shape, entire contact surfaces for traction

ALTERNATIVE DESIGN MATRIX

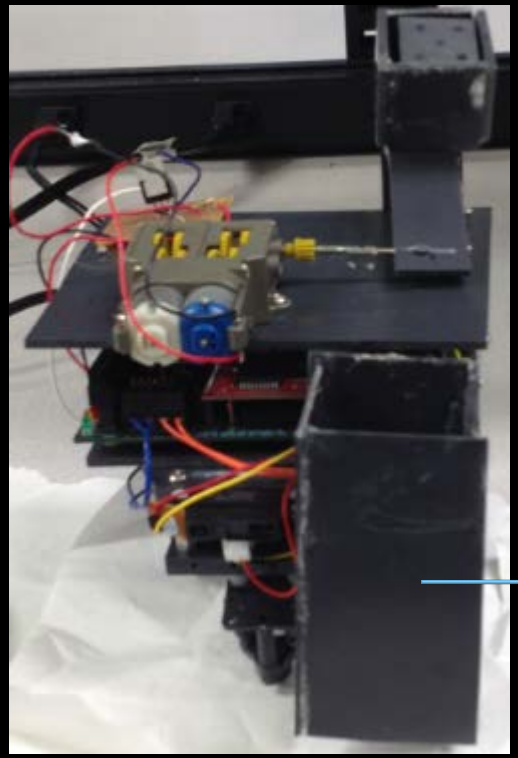
Urban Search and Rescue Project Alternative Design Matrix

		All Combinations of Design Parameters comprising Conceprtual Designs							
		Ramp		**Conveyor belt**		**Arm & Funnel**		**Pulley**	
Lowering Mechanism		Inclined Plane		Belt with incline plane		Arm & Funnel		Block-and-tackle	
Able to be powered by motor		Yes		Yes		Yes		Difficult	
Drop Cube within range		Difficult		Difficult		Yes		Yes	
Acceptance Criteria (as many as team likes)	**Weight (by %) of Acceptance Criteria (apply last)**	**Scoring of the importance of each Conceptual Design in meeting Acceptance Criteria (Max 10)**	**Weighted Score**	**Scoring of the importance of each Conceptual Design in meeting Acceptance Criteria (Max 10)**	**Weighted Score**	**Scoring of the importance of each Conceptual Design in meeting Acceptance Criteria (Max 10)**	**Weighted Score**	**Scoring of the importance of each Conceptual Design in meeting Acceptance Criteria (Max 10)**	**Weighted Score**
Aesthetics	15%	7	1.05	9	1.35	8	1.20	8	1.20
Accuracy	25%	7	1.75	7	1.75	9	2.25	7	1.75
Efficiency	25%	8	2.00	8	2.00	9	2.25	6	1.50
Weight(Light)	15%	7	1.05	7	1.05	8	1.20	8	1.20
Complexity	20%	6	1.20	9	1.80	9	1.80	8	1.60
	========		========		========		========		========
Total Percentage =	100%		7.05		7.95		**8.70**		7.25

BODY/MECHANICAL



Side view



Front view

MATERIAL OF CHOICE

-Plastic
  -Moldable

  -Sturdy

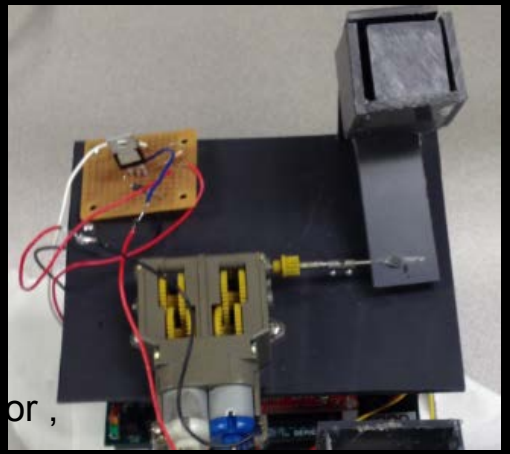
  -Aesthetics

BASE

-Serves as platform upon which drop-off mechanism is mounted

-Connected via screws to supports

-Dimensions: 3” by 4.5”



or ,

SUPPORTS

-Hold up the base

-2 supports

-Dimensions: 2” by 2”

CUBEHOLDER

-Designed to encompass the cube

-Dimensions: Each side is 1.2”

-Holds cube firmly but leaves space for dropping it

CubeHolder
with cube

ARM

-Connected to motor via shaft

-Dimensions: 3” long by 1” wide

-“Rests” upon ledge

Arm with CubeHolder attached

FUNNEL

-Connected to base via screw

-Dimensions: 2" wide by 4" long

-Positioned just ½" above ground to prevent cube from bouncing

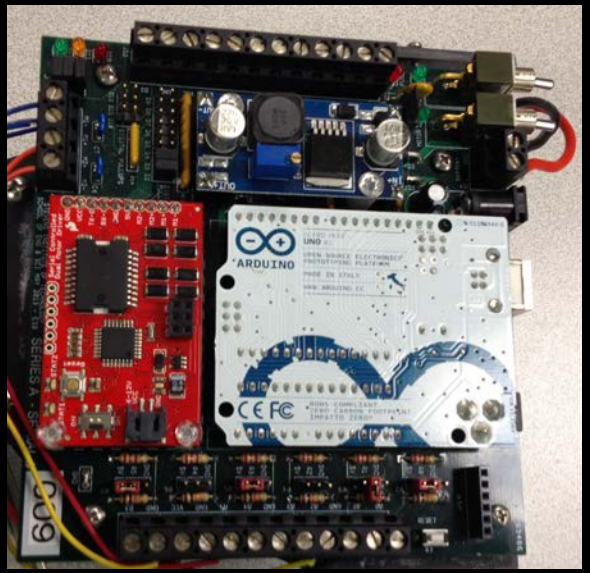
ELECTRICAL ENGINEERING

-PIC Board

-Uses Arduino UNO

-9v battery

-3 motors



SENSORS

-Infrared Sensor

-Sense its surroundings by either emitting or detecting infrared radiation

-Heat of an object or detecting motion

-Not visible to human eye

-Proximity Sensor

-Emits electromagnetic field or a beam of radiation

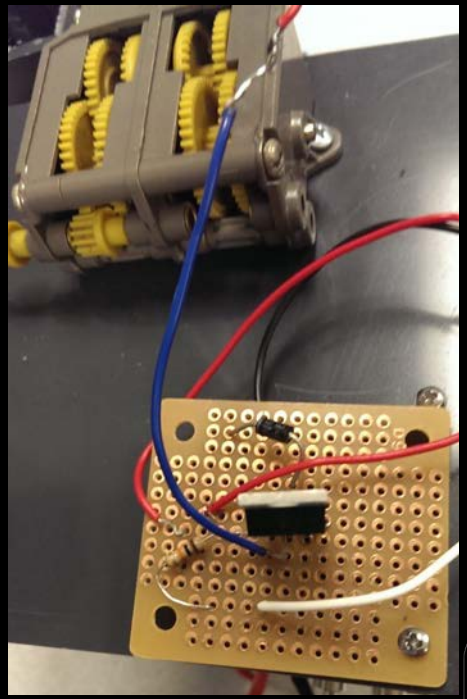
-Monitors changes in the field

-No physical contact

THIRD MOTOR CIRCUIT

-Arduino doesn't blow up

-Components:
- -1N4001 diode
- -10k ohm resistor
- -TIP121 NPN Transistor
- -Motor



JOYSTICK CALIBRATIONS

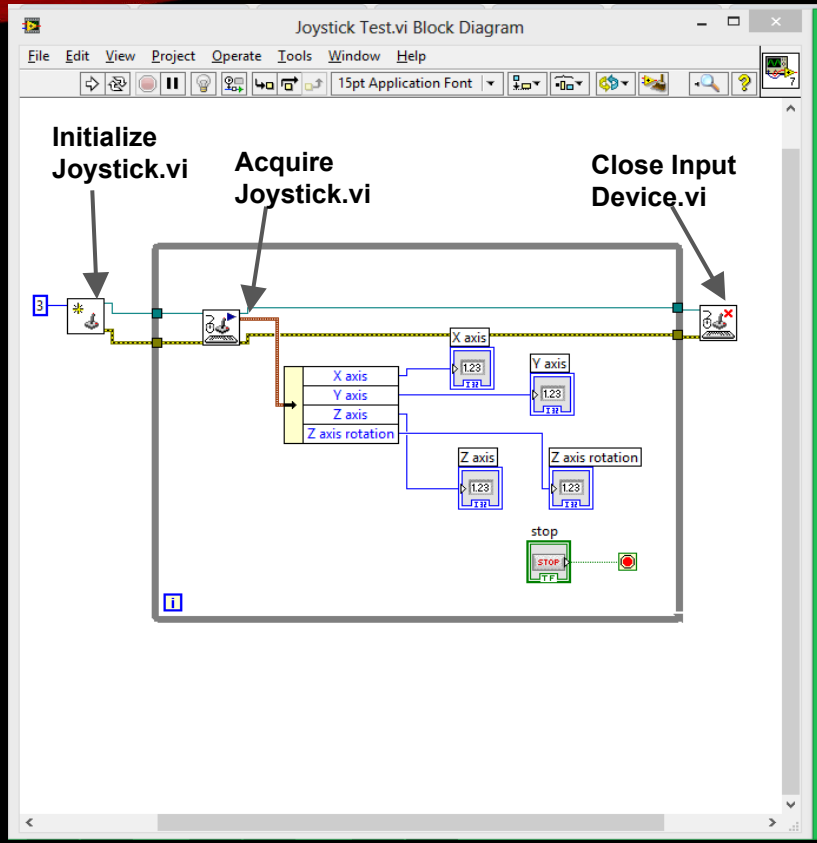
-Logitech extreme 3D pro Joystick

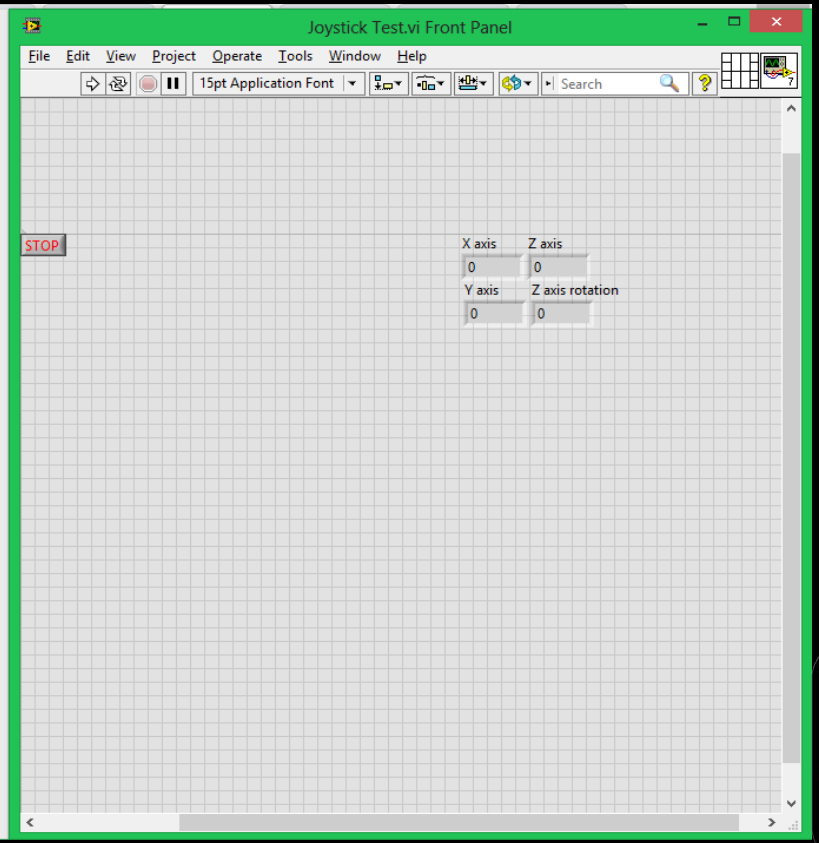
-X,Y,Z, Z rotational axis
    -X,Y,Z rotational axis max = 33,000

    -X,Y,Z rotational axis min = -33,000

-Sample block diagram for calibration and initialization

JOYSTICK CALIBRATION BLOCK DIAGRAM





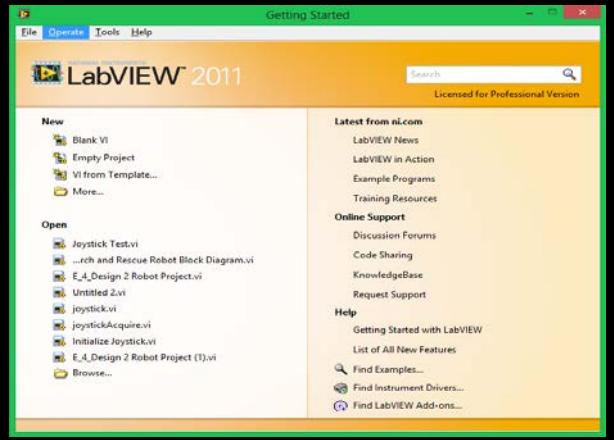
SOFTWARE

-National Instruments LabView 2011

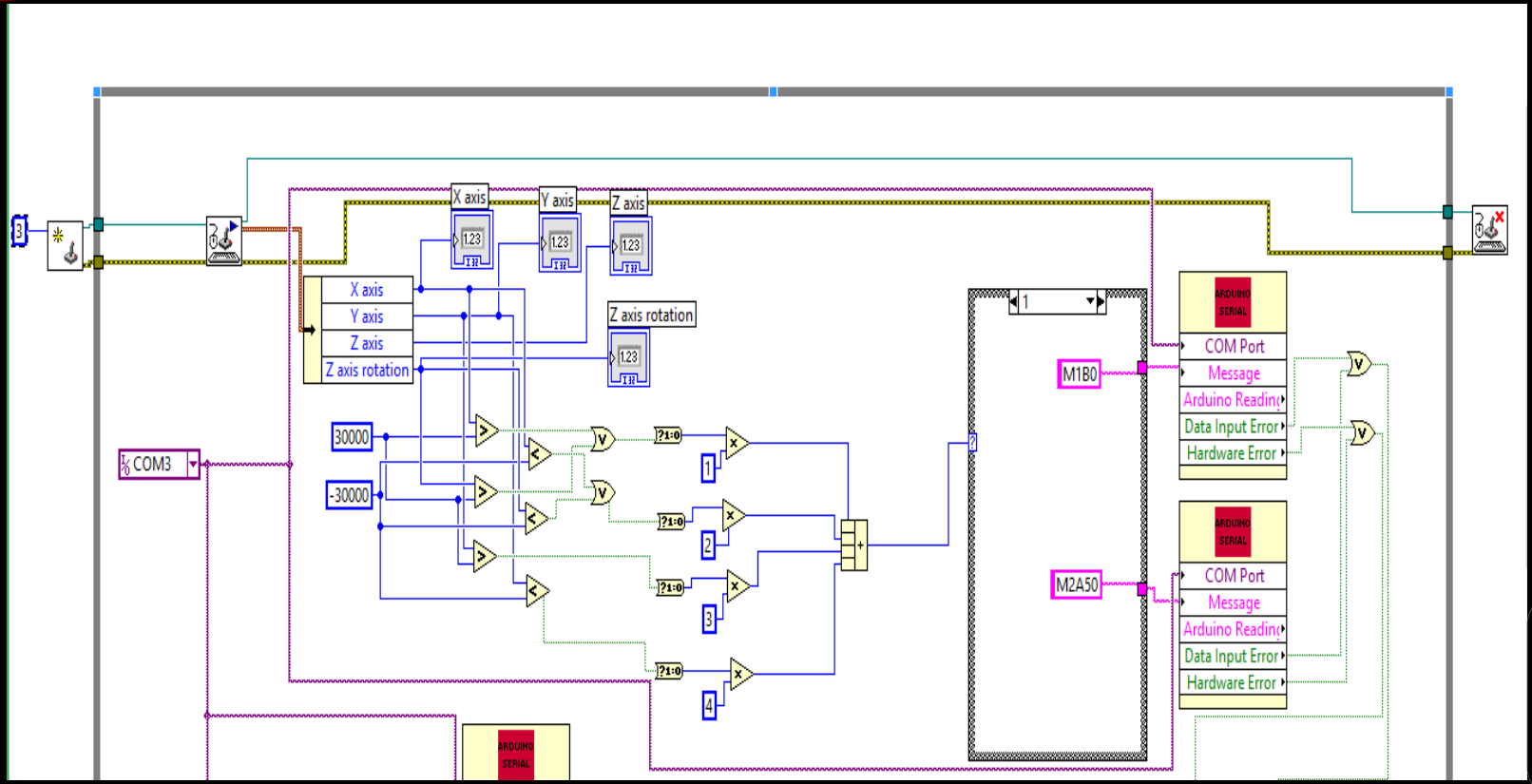
-Highly productive development environment for creating custom applications that interact with real-world data or signals in fields such as science and engineering

-SubVI's

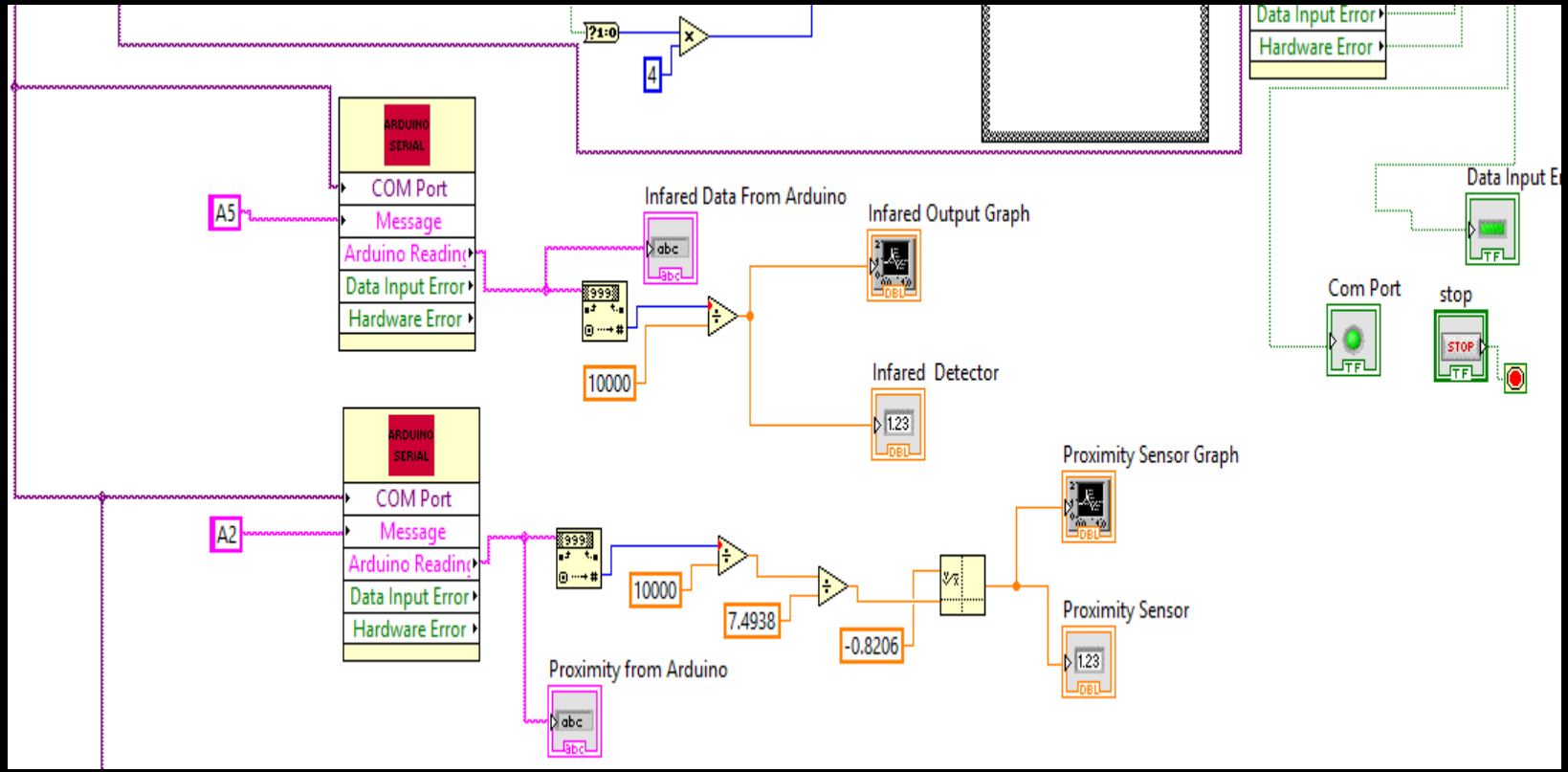
Subroutines by modularity



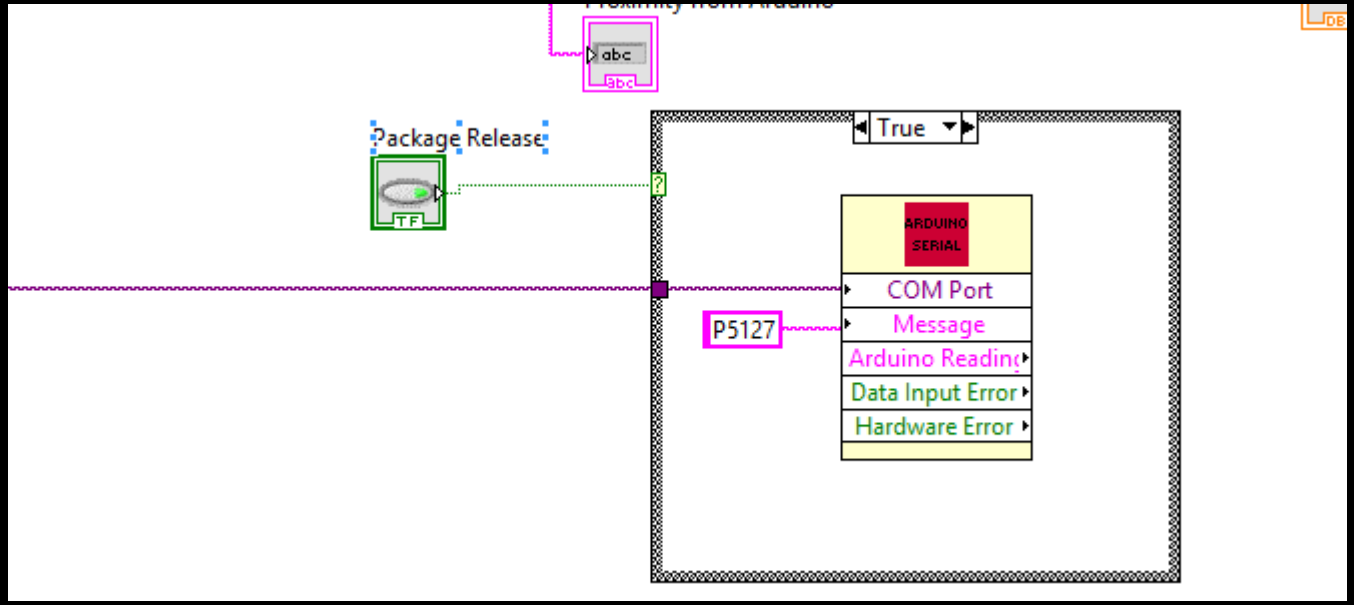
BLOCK DIAGRAM(MOVEMENT)



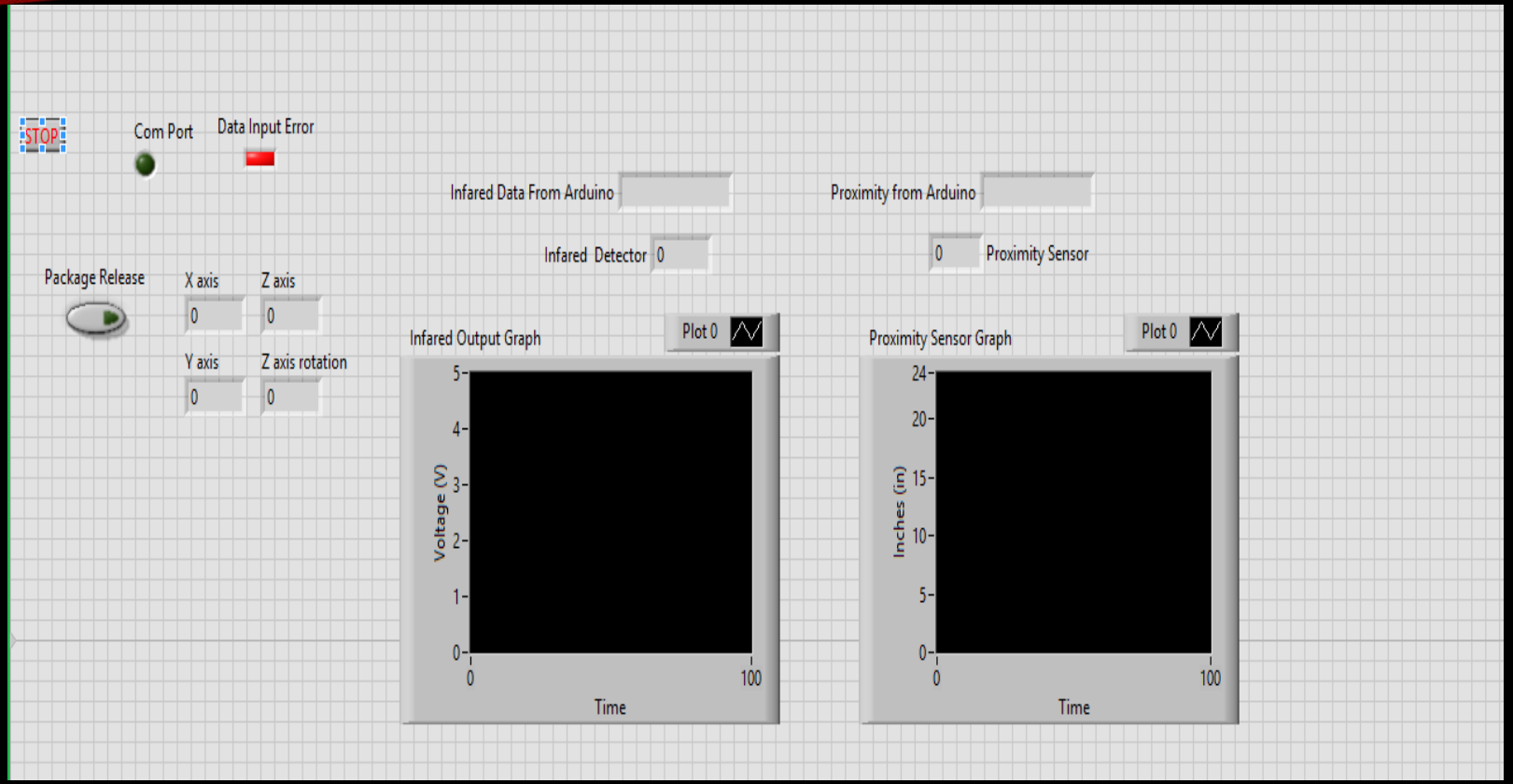
BLOCK DIAGRAM (SENSORS)



BLOCK DIAGRAM(PACKAGE RELEASE)



FRONT PANEL (OUTPUT)



APPLICATIONS IN SPACE

-Dropping off marker for future explorers

-Dropping off package of aid for people

WORKS CITED

http://www.ni.com/newsletter/51141/en/

http://www.technologyreview.com/news/407603/amoebalike-robots-for-search-and-rescue/

https://www.ri.cmu.edu/research_project_detail.html?project_id=407&menu_id=261

http://digital.ni.com/public.nsf/allkb/CA411647F224787B86256DD000669EFE

http://www.adafruit.com/datasheets/TIP120.pdf

http://zone.ni.com/reference/en-XX/help/371361J-01/glang/case_structure/